

# Engineering News

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BERKELEY LAB ENGINEERING DIVISION



## ENGINEERING: IN PARTNERSHIP WITH SCIENCE

If the recommendations of the Engineering Task Force (ETF) can be distilled into one key imperative, it is this: develop and implement a strategic technical plan. The Engineering Division strategic plan is technical in that it will capture the intersection of all the programmatic divisions' strategic plans with their short- and long-term engineering requirements.

The Engineering strategic plan will be characterized by a strong partnership between the programmatic divisions and the Engineering Division. The American Heritage

Dictionary of the English Language defines "partnership" as "a relationship between individuals or groups that is characterized by mutual cooperation and responsibility, as for the achievement of a specified goal." At Berkeley Lab, that means each partner shares in all the liabilities and all the benefits to achieve a common objective.

In this issue we follow up on our article in the July issue of *Engineering News*—"Engineering Focus on Partnership"—and look at what makes a successful science and engineering partnership a reality. The focus is on two such

## Berkeley Lab and Russian Scientists and Engineers Harness the Wind

The Makeyev State Rocket Center (MSRC) in Miass, Russia, used to make missiles for Russian submarines. Now in partnership with Berkeley Lab's Engineering Division, they make wind turbines to generate electricity for single-family homes.

Over the last two years, scientists and engineers at MSRC have collaborated with Berkeley Lab

and Empire Magnetics of Rohnert Park, CA to develop a small-scale Vertical Axis Wind Turbine (VAWT) for generating 3-70 kilowatts (kW) of power. A new company known as Wind Sail will commercialize the finished product. According to Berkeley Lab project manager Joseph Rasson, "The main goal of the program is to develop tech-

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partnerships: a transatlantic partnership to create a small-scale wind turbine; and support to the SNAP project by development of radiation-resistant integrated circuitry that can survive the demands of outer space.

Future issues will focus on other science and engineering partnerships and the further evolution of our strategic technical plan.



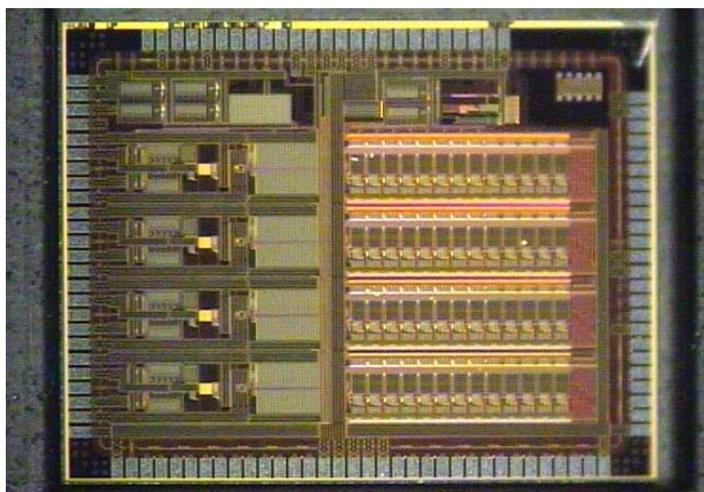
Three-kilowatt wind turbine to be tested in October.

## Success for Engineering and SNAP

There have been remarkable advancements in imaging sensors and readout electronics in recent years. The application of modern semiconductor fabrication techniques and the introduction of customized large-scale integrated circuits have made big imaging systems routine in high-energy physics.

The Supernova/Acceleration Probe (SNAP) telescope team wanted to apply these technologies to the hunt for distant supernovae, so they asked the Engineering Division for help. Now, after two and a half years of effort, an engineering team led by Henrik von der Lippe has tested a second-generation prototype of a radiation-tolerant integrated circuit (IC) for reading out CCD image data on the SNAP telescope.

SNAP will operate in a demand-



What's able to survive in Earth orbit, uses very little power, is radiation tolerant, and can read high-resolution astronomical image data? The answer: The 2nd-generation prototype of an integrated circuit developed for SNAP by Berkeley Lab's Engineering Division.

ing space environment, requiring radiation-tolerant readout electronics that can survive in temperatures as low as  $-208$  degrees Fahrenheit ( $140$  degrees Kelvin). According to von der Lippe, "resolution and power consumption" were the biggest design challenges for this IC. Located on the focal

plane of the telescope, the IC had to be energy-efficient and able to produce unusually high-resolution images.

A new concept in IC architecture was required for this project. The analog front-end was prototyped and successfully tested in 2003. In 2004, a custom-built 13-bit pipeline ADC has been added to the analog front-end, and testing of this second-generation CCD readout IC (CRIC2) has begun.

Preliminary test results indicate that this circuit performs as designed, verifying that this technology will satisfy SNAP's demanding requirements. The design and test team included Jean-Pierre Walder and Brad Krieger as IC designers, with Armin Karcher, Sebastian Kurz, Jens Steckert, Markus Rebelstab, and Max Fabricius as test engineers.

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## Harnessing the Wind

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nology that will economically sustain the Russian scientists for the long term."

The Wind Sail prototype, which would typically be rated as a "1500 watt" turbine, looks like a thirty-foot-tall eggbeater with vertical fiberglass blades that are twelve feet tall. Unlike other vertical designs, this turbine is self-starting and relatively quiet. VAWT offers a number of advantages over con-

ventional Horizontal Axis Wind Turbines (HAWT), such as lower maintenance costs and increased durability and reliability.

This partnership for clean energy was created under the sponsorship of the Department of Energy's Initiatives for Proliferation Prevention (IPP) Program, managed at Berkeley Lab by Glen Dahlbacka, and designed to employ former

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## SAFETY CORNER

### How to Supervise Safely

Most safety engineers agree that “supervising safely” involves two major components that must coexist: (1) individual commitment to safety training; and (2) establishing, following, and testing rigorous safety processes and procedures.

#### Individual Commitment to Safety Training

“The one thing that keeps me awake at night is asking myself: Have I done everything I can so that all my direct reports will go home safely to their loved ones?” This concern, expressed by a supervisor in a millworks, helps explain what motivates supervisors to “supervise safely.”

One answer to the question “Have I done everything I can?” is found when supervisors assure all ergonomic/safety evaluations and all required safety training are kept current.

Typical findings during many safety investigations reveal a

The SAFETY CORNER is designed to promote awareness of safe work practices for employees of the Engineering Division.

supervisor or an employee who did not retake a required safety course prior to the expiration date. Supervisors who “get it” want to know that required safety coursework is current for themselves, and their direct reports.

If you are a supervisor, take a moment to review the required coursework for all your direct reports. This information is available at <https://ehswprod.lbl.gov/EHS/Training/Jhq/EHSLogin.asp>

#### Establishing, Following, and Testing Rigorous Safety Processes and Procedures

Daimler-Chrysler has a long history of safety innovation and excellence. CEO Dieter Zetsche relates that this commitment caused the company at one point to incur an expensive redesign of one of its vehicles. “Good enough” simply wasn’t good enough for Chrysler.

To achieve safety excellence, each Chrysler supervisor and employee was required to establish, follow, and test for safe processes and procedures to prevent accidents/injury and ensure a safe work environment. Safety professionals were available to help, but it was the employees and line supervisors that were accountable for safe practices.

If you are a supervisor, review the job and safety requirements of your direct reports and observe actual practice to test for safe performance. Walk around the work areas of all your direct reports and learn more about their work environment. Invite our Safety Professional, Matt Kotowski, to accompany you on some of your visits.

Supervisors who “get it” ensure that best practices for safety and health are adopted consistently throughout their company. They lead in the establishment of safety initiatives and create systems that measure and reward employees for their safe performance to drive the desired behavior.

## Harnessing the Wind

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Soviet weapons scientists and engineers in peaceful commercial pursuits. A portion of the IPP funds go to Berkeley Lab to provide project management, energy market research, and critical technical oversight of engineering calculations and prototype test results.

In the face of rising fossil fuel costs and carbon dioxide emis-

sions, byproducts of the Industrial Age, the clean energy offered by wind power offers hope for a better world. Berkeley Lab’s successful partnership with MSRC has helped to redesign the weapons of the old world into weapons for peace and a cleaner environment.

For more information, visit <http://www.wind-sail.com>



Joseph Rasson, Berkeley Lab Wind Power Project Manager

## David McGraw Speaks on Ethics and Accountability

To foster understanding of ethics policies and provide a framework for ethical decision making, with special emphasis on the obligations of managers to model ethical behavior, Dr. David McGraw, Division Director of Business Services, offered two July presentations on "Ethics and Accountability" to Engineering employees.

McGraw explained that values and ethics "... are not about what we say, or intend, nor are they simply a written code or a framed credo. They're what we do." Emphasizing the obligations of managers to model ethical behavior, McGraw said, "An organization takes on the character of its leader."

McGraw said that shared values create a sense of common direction for the entire staff, a sense of stability and continuity in a rapidly changing environment, and the social energy that moves the organization into action, forming the basis of thoughtful decision making.

He also stated that "Ethics transcends the law: There is a big difference between what you have a right to do and what is right to do."

He ended the presentation with a quote from Thomas Watson, Jr., the CEO of IBM: "I firmly believe that any organization, in order to survive and achieve success, must have a sound set of beliefs (values) on which it premises all of its policies and actions."

## Over 200 Engineering Employees Get Together for August BBQ, Picnic, and Raffle

Two hundred and eleven Engineering employees got together on Friday, August 6th, to enjoy fine food and conversation during our Division-wide picnic.

Many thanks to Elizabeth Saucier, Lisa Rebrovich, Madonna Fricken, Sreela Sen, Paris Gordon, Ed Tully, Hal Harcourt, and Cynthia Jones, who invested many hours over six weeks to plan the event.

Their efforts gave everyone the opportunity to enjoy great food, meet employees they wouldn't normally see during a typical work week, and enjoy some unanticipated fun!

The menu included tri-tip steak, marinated chicken, garden salad, rolls, homemade chili, and ice cream. All picnic revelers were automatically entered in a raffle that included DVD movies, golf ball sets, books, CDs, candles, gourmet olive oil, decorative platters, and car washing equipment.

Joining the picnickers were Nuclear Science Division Director Dr. James Symons and Deputy Laboratory Director for Operations Sally Benson.



211 Engineering employees enjoy fine food and conversation.



## RECENT ENGINEERING PUBLICATIONS

### ALS Control System IP I/O Module Upgrade

A report on the new double-size IndustryPack (IP) input-output (I/O) instrumentation control modules designed for the ALS by the Instrumentation Group. These modules control instruments such as magnet power supplies and beam position monitors. This paper discusses the issues related to the current IP I/O module and the design of an upgraded double-size IP2 I/O module, to be installed in early 2005. J. Weber, M. Chin, Beam Instrumentation Workshop 2004 Conference Paper, Knoxville, TN (May 2004); LBNL/PUB-54954.

### Comparison of Aerobic and Anaerobic Biotreatment of Municipal Solid Waste

A study demonstrating the superiority of aerobic bioreactors over anaerobic bioreactors for the degradation of municipal solid waste (MSW) landfills. Bioreactors optimize the conditions for microbial decomposition and accelerate stabilization and settling, thus allowing for additional MSW disposal or faster land re-use. Aerobic tanks reduced stabilization time and produced negligible

odor compared with anaerobic tanks. S. Borglin, T. Hazen, C. Oldenburg, P. Zawislanski, Journal of the Air and Waste Management Association 54, 815-822 (2004); LBNL/PUB-50576.

### Incorporating Psychological Influences in Probabilistic Cost Analysis

A strategy for realistic budgeting and contingency management using probabilistic cost analysis with real-world influences. This model incorporates recent findings in human behavior and judgment under uncertainty, valid mathematical techniques, the "Money Allocated is Money Spent" (MAIMS principle), and successful project management practices. E. Kujawski, M. Alvaro, and W. Edwards, Systems Engineering 7(3), 195-216 (2004); LBNL/PUB-54276.

### Superbend Upgrade of the Advanced Light Source

An overview of the Superbend Project at the Advanced Light Source (ALS), describing superconducting magnet enhancements to the facility that expanded its capabilities for protein crystallography and other applications. This was the biggest upgrade to the ALS storage ring since

it was commissioned in 1993. D. Robin, R. Benjegerdes, A. Patterson, R. Schlueter, W. Thur, C. Timossi, J. Zbasnik, A. Biocca, et al. To be submitted to Nuclear Instruments and Methods A (2004); LBNL/ PUB-52637.

### New Waveguide-Type HOM Damper for ALS Storage Ring Cavities

A report on the electrical design of the new performance-enhancing waveguide HOM damper for the main radio frequency (RF) cavities of the ALS storage ring. HOM dampers are used to stabilize the electron beam in the storage ring. Installation is scheduled during the next shutdown period in May 2005. S. Kwiatkowski, K. Baptiste, J. Julian, 2004 EPAC Conference Paper, Lucerne, Switzerland (July 2004); LBNL/ PUB-55631.

For copies of any of these articles, see the Library's Reports Catalog search page, <http://www-library.lbl.gov/teid/tmRco/catalog/RcoCatalog.htm>, or contact the library directly by calling x5621 or sending email to [library@lbl.gov](mailto:library@lbl.gov).

## Engineering Division Launches New Web Site

LBNL's Engineering Division is pleased to announce the debut of its new Web Site: <http://engineering.lbl.gov/>.

The Engineering Division exists to develop, design, and build scientific apparatus. The Division is a proven leader and

innovator in the devices, tools, and techniques required to solve complex scientific problems.

This Web Site provides general information about LBNL Engineering programs and projects. Also available to Lab employees is information on

HR, budget, property, and EH&S policies and procedures.

As the site matures, it will become a complete reference tool and index with links to all Engineering Division programs, projects, and resources, and innovations.